WHAT IS CLAIMED IS:

1. A method of localizing radiopharmaceutical markers in a body lumen:

advancing a detector array through the body lumen;

operating the detector array at a gross count rate; and

operating the detector array at a higher resolution imaging mode when a threshold count rate is detected.

2. The method of claim 1 wherein operating the detector array comprises summing all of the pixel responses in the detector array to obtain the gross count of the radiopharmaceutical markers.

3. The method of claim 1 wherein the detector array provides a spatial resolution of one to three millimeters.

4. The method of claim 1 wherein the radiopharmaceutical markers emit beta particles.

5. The method of claim 1 wherein the radiopharmaceutical markers are bound to unstable plaque.

6. The method of claim 5 wherein advancing the detector array comprises advancing a catheter having the detector array on a distal portion of the catheter.

7. The method of claim 6 wherein advancing comprises moving the catheter over a guidewire through the body lumen.

8. The method of claim 5 further comprising pressing the detector array against a body lumen wall during the higher resolution imaging mode.

9. The method of claim 8 wherein the detector array is disposed on an inflatable balloon at a distal end of an intravascular catheter, wherein pressing comprises expanding the inflatable balloon.

10. The method of claim 9 wherein the detector array comprises an array of semiconductor detectors.

11. The method of claim 9 wherein the detector array comprises an ionization detector.

12. The method of claim 9 wherein the detector array comprises a gas scintillator.

13. The method of claim 1 wherein the detector array comprises a scintillator and an optical fiber.

14. The method of claim 1 wherein the detector array comprises an imaging plate.

15. An intravascular imaging catheter comprising:

a catheter body comprising a proximal portion and a distal portion; and

a radiation detector array disposed at the distal portion of the catheter body, wherein the radiation detector are capable of operating both at a gross count rate and in an imaging mode.

16. The catheter of claim 15 further comprising means for operating the radiation detector array selectively in at least the gross count rate mode and the imaging mode.

17. The catheter of claim 15 wherein the radiation detector array in the search mode sums pixels in the radiation detector(s) to obtain a gross count of radiopharmaceuticals in a portion of a body lumen.

18. The catheter of claim 15 wherein the radiation detector array in the imaging mode obtains a higher resolution of detail of a body lumen.

19. The catheter of claim 15 wherein the radiation detector array provides a spatial resolution of one to three millimeters.

20. The catheter of claim 15 wherein the radiation detector array comprises:

a scintillator disposed in the channel in the catheter body.

an optical fiber disposed within the channel in the catheter body, wherein a distal end of the optical fiber is coupled to the scintillator;

a photodetector coupled to a proximal end of the optical fiber; and

a data acquisition assembly coupled to the photodetector.

21. The catheter of claim 15 wherein the radiation detector array comprises an array of scintillators distributed along a length of the catheter body.

22. The catheter of claim 21 wherein the array of scintillators are distributed along a length between approximately 5 mm and 50 mm.

23. The catheter of claim 21 wherein each of the scintillators in the array of scintillators is coupled to an individual optical fiber.

24. The catheter of claim 21 wherein the array of scintillators comprise a plurality of scintillators aligned along an axis, wherein each of the scintillators has an emission spectrum that is offset in wavelength from the other scintillators in the array.

25. The catheter of claim 24 wherein a proximal scintillator of the array is optically coupled to an optical fiber that is attachable to a wavelength dispersive medium.

26. The catheter of claim 15 further comprising an flexible membrane disposed at the distal portion of the catheter body, wherein the radiation detector array is disposed within the balloon.

27. The catheter of claim 26 wherein the radiation detector array comprises:

a scintillating fiber coupled to an optical fiber, wherein the scintillating fiber is disposed within the flexible membrane;

a moveable imaging shield disposed over a portion of the scintillating fiber; and

a liquid scintillator disposed within the flexible membrane.

28. The catheter of claim 26 wherein the radiation detector array comprises a flexible array of semiconductor detectors coupled to the flexible membrane, wherein the balloon in an expanded configuration places the array of radiation detectors adjacent a body lumen wall.

29. The catheter of claim 26 further comprising:

an anode disposed within the flexible membrane;

a moveable insulating sleeve disposed over the anode;

cathodes attached to the flexible membrane; and

an Xenon gas disposed in the flexible membrane.

30. The catheter of claim 15 wherein the radiation detector array comprises:

an optical fiber moveably disposed within the catheter body;

a laser that delivers a laser light having a first wavelength;

an imaging plate disposed around a distal portion of the optical fiber that receives beta particles, wherein the laser light interacts with the imaging plate so as to cause a readout light to be emitted from the imaging plate and transmitted down the optical fiber, wherein the readout light has a second wavelength, the second wavelength being different from the first wavelength.

31. The catheter of claim 30 further comprising a filter coupled to a proximal end of the optical fiber.

32. The catheter of claim 30 further comprising a mirror coupled to a distal end of the optical fiber to focus the laser light and readout light.

33. An intravascular imaging catheter comprising:

a catheter body;

a first scintillator that generates light within a first emission spectrum;

a second scintillator that generates light within a second emission spectrum, wherein the first emission spectrum is offset in wavelength from the second emission spectrum, wherein the first and second scintillator are disposed on the catheter body; and

an optical delivery device that can transmit light from the first scintillator and second scintillator to a photodetector.

34. The catheter of claim 33 wherein the first scintillator and second scintillator are aligned along an axis that is optically aligned with the optical delivery device.

35. The catheter of claim 34 further comprising at least one intermediate scintillator disposed between the first and second scintillators, wherein the intermediate

scintillator(s) can emit a light in an emission spectrum that is offset in wavelength from the first and second emission spectrum.

36. The catheter of claim 33 wherein the first emission spectrum has a larger wavelength than the second emission spectrum

37. The catheter of claim 36 wherein the light emitted from the first scintillator passes through the second scintillators without exciting the second scintillator.

38. The catheter of claim 33 wherein the first and second emission spectrum emit light that has a wavelength between approximately 400 nanometers and 600 nanometers.

39. The catheter of claim 33 further comprising a spectrophotometer coupled to a proximal end of the optical delivery device.

40. The catheter of claim 39 wherein the spectrophotometer comprises a grating that spreads the transmitted light over a position sensitive photodetector.

41. The catheter of claim 33 wherein the optical delivery assembly comprises a first optical fiber coupled to the first scintillator and a second optical fiber coupled to the second scintillator.

42. The catheter of claim 41 wherein the first and second scintillator are distributed along a length of the catheter body, wherein the first and second scintillator are offset circumferentially from each other.

43. The catheter of claim 42 comprising at least one intermediate scintillator, wherein the intermediate scintillator(s) emits light in a spectrum that is offset from the light emitted from the first and second scintillators.

44. The catheter of claim 33 wherein the catheter comprises a lumen that can receive a guidewire.

45. The catheter of claim 33 wherein the catheter body comprises a tapered distal tip.

46. The catheter of claim 33 wherein the scintillators comprise scintillating phosphors and polystyrene.

47. The catheter of claim 33 wherein the first and second scintillators each have a length between approximately two millimeters and seven millimeters.

48. The catheter of claim 33 wherein the photodetector is a photomultiplier tube.

49. The catheter of claim 33 wherein the first and second scintillators each have a stopping power to absorb at least approximately 60 keV.

50. The catheter of claim 33 wherein the diameter of the scintillators is less than approximately one millimeter.

51. A method of characterizing unstable plaque a body lumen, the method comprising:

positioning first and second scintillators at a target site in the body lumen;

generating light in at least one of the scintillators in response to radiation attached to the unstable plaque, wherein light generated in the first scintillators has a first emission spectrum and light generated in the second scintillator is in a second emission spectrum, wherein the first emission spectrum is offset in wavelength from the second emission spectrum; and

transmitting the light generated in the first and second scintillators down an optical fiber.

52. The method of claim 51 comprising separating the different wavelength light from the optical fiber.

53. The method of claim 52 comprising transmitting the separated light from the into a photodetector.

54. The method of claim 51 wherein positioning comprises advancing a catheter through a body lumen, wherein the catheter carries the first and second scintillators.

55. The method of claim 51 wherein the first and second scintillators disposed along an axis.

56. An imaging catheter comprising:

a catheter body comprising a proximal portion and a distal portion;

a flexible membrane disposed at the distal portion of the catheter body, wherein the flexible membrane is movable between a deflated position and an inflated position; and

an array of radiation detectors coupled to the flexible membrane.

57. The catheter of claim 56 wherein the radiation detector comprises:

a liquid scintillator disposed within the flexible membrane, wherein the liquid scintillator can absorb a beta particle and emit a first scintillation light; and

a scintillator optically coupled to a distal end of an optical fiber, wherein the scintillator is disposed within the flexible membrane to absorb the first scintillation light from the liquid scintillator and to transmit a second scintillation light down the optical fiber.

58. The catheter of claim 57 comprising a moveable shield disposed over the scintillator.

59. The catheter of claim 57 further comprising a photodetector coupled to a proximal end of the optical fiber to receive the second scintillation light.

60. The catheter of claim 57 wherein the catheter body comprises a lumen for delivering the liquid scintillator into the flexible membrane.

61. The catheter of claim 57 wherein the flexible membrane in the inflated configuration has a diameter that is between approximately two and three times larger than the diameter of the flexible membrane in the deflated configuration.

62. The catheter of claim 57 wherein the scintillator has a length between approximately five centimeters and ten centimeters.

63. The catheter of claim 57 wherein the first scintillation light has a shorter wavelength than the second scintillation light transmitted down the optical fiber.

64. The catheter of claim 56 wherein the radiation detectors comprise a series of semiconductor radiation detectors attached to the flexible membrane.

65. The catheter of claim 64 wherein the semiconductor detectors are Si-pin diodes.

66. The catheter of claim 64 wherein the flexible membrane in the expanded configuration presses the semiconductor radiation detectors against a radiopharmaceutical coupled to a wall of a body lumen.

67. The catheter of claim 64 wherein the flexible membrane comprises an inner and outer layer, wherein the semiconductor radiation detectors are disposed between the inner and outer layer.

68. The catheter of claim 64 wherein the flexible membrane in the inflated configuration is filled with Xenon.

69. The catheter of claim 56 further comprising:

an inner electrode disposed within the flexible membrane;

a moveable insulating sleeve disposed over the inner electrode;

an outer electrode attached to the flexible membrane; and

an Xenon gas disposed in the flexible membrane.

70. The catheter of claim 69 further comprising a mesh insulator disposed between the outer electrode and the inner electrode.

71. An intravascular imaging probe comprising:

a body comprising a proximal portion and a distal portion;

an optical fiber movably disposed within the body;

an imaging plate disposed on the distal portion of the body about a distal portion of the optical fiber, wherein beta radiation is absorbed and stored as stable energy in the imaging plate; and

a laser to deliver a laser light through the optical fiber to excite the stable energy in the imaging plate so as to release light into the optical fiber.

72. The catheter of claim 71 wherein the imaging plate comprises phosphor.

73. The probe of claim 72 comprising a filter that filters the released light transmitted through the optical fiber.

74. The probe of claim 71 further comprising a concave mirror positioned at a distal end of the optical fiber that directs the laser beam and released light between the imaging plate and the optical fiber.

75. The probe of claim 71 wherein the laser light has a wavelength of 630 nanometers.

76. The probe of claim 71 wherein the released light has a wavelength of approximately 400 nanometers.

77. A method of locating and characterizing radiopharmaceuticals in a body lumen, the method comprising:

advancing a catheter through the body lumen; and

expanding a flexible membrane on the catheter to move the radiation detectors closer to the radiopharmaceuticals in the body lumen.

78 The method of claim 77 comprising operating the radiation detectors in search mode to determine the presence of radiopharmaceuticals in the body lumen.

79. The method of claim 78 wherein expanding is carried out when it is determined from the search mode that a concentration of radiopharmaceuticals are present in the portion of the body lumen.

80. The method of claim 79 comprising switching the radiation detectors to an imaging mode to obtain a high resolution of the radiopharmaceuticals.

81. The method of claim 77 comprising attaching the radiopharmaceuticals to unstable plaque.

82. The method of claim 77 wherein the radiation detectors comprise a semiconductor radiation detector, a scintillator, an ionization chamber, or an imaging plate.

83. The method of claim 77 wherein the flexible membrane is in a deflated configuration during advancing.

84. The method of claim 77 wherein the radiation detectors provide a spatial resolution of one millimeter to three millimeters.

85. The method of claim 77 wherein advancing comprises moving the catheter over a guidewire.

86. The method of claim 77 comprising transmitting information from the radiation detector to data acquisition electronics.

87. A kit comprising:

a catheter comprising at least one radiation detector that can switch between a search mode and an imaging mode;

instructions for use in operating the radiation detector in search mode during transit through a body lumen and switching to imaging mode after a high count rate is localized with the search mode; and

a package adapted to contain the device and the instructions for use.

88. A kit comprising:

a catheter comprising at least one radiation detector disposed on an expandable flexible membrane;

instructions for use comprising advancing the catheter to a target site and expanding the balloon from a deflated configuration to an expanded configuration; and

a package adapted to contain the device and the instructions for use.